

Article

Attributional Style in Mathematics across Anxiety Profiles in Spanish Children

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Abstract: This research aimed to examine the relation between child anxiety and causal attributions in mathematics using a person-centered approach. The Visual Analogue Scale for Anxiety-Revised and the Sydney Attribution Scale were administered to 1287 Spanish students aged 8 to 11 ($M = 9.68$, $SD = 1.20$); 49.4% were girls. Four child anxiety profiles were obtained by the latent class analysis technique: Low Anxiety, Moderate Anxiety, High Anxiety, and Low Anxiety School-type. The four anxious groups significantly differed in all attributions of failure and in attributions of success to ability and effort, with effect sizes ranging from small to large ($d = 0.24$ to 0.99). The group with the highest anxiety levels attributed its failures more to the lack of ability and effort, and less to external causes. This group attributed its successes less to ability and effort. However, the Low Anxiety School-type group attributed its failures more to external causes and its successes more to ability and effort. The practical implications of these findings suggest that applying cognitive-behavioral programs for anxiety with a component of attribution retraining could be useful to improve both anxiety levels and the maladaptive attributional pattern of each child anxiety profile.

Keywords: anxiety; causal attributions; latent class analysis; mathematics; primary education

1. Introduction

Anxiety, understood as an emotion that allows anticipating future dangers, constitutes an essential part of child development [1]. The problem arises when children experience severe symptoms, and their behavior and participation in everyday settings like school are affected [2]. In this sense, Lee and Stankov [3] and Koçar [4] have identified anxiety as an influential factor in poor academic performance in mathematics. The authors used data from the mathematics-focused editions of the Program for International Student Assessment (PISA) in the years 2003 and 2012, respectively.

According to Tornare, Czajkowski, and Pons [5], the probability that students have of experiencing anxiety can increase or decrease depending on their attributional style in mathematics (i.e., their preference to use certain kinds of causal interpretations to explain their successes and failures [6]). Weiner [7], in his attributional theory, argues that people spontaneously search for the reasons why events occur, especially whether these events are surprising or negative. Specifically, this theory tries to explain the cognitive processes by which individuals establish the cause of a result, and the way in which these attributions influence behavior thorough emotions and expectations (see Weiner [8] for a review). In this sense, Weiner's model states that successes and failures are attributed mainly to ability, to effort, and to external causes such as luck or task difficulty. It also reports that any causal attribution can be categorized by three dimensions: (a)

Locus of causality, according to whether the cause is within (internal) or outside (external) the person; (b) stability, depending on whether the cause is permanent (stable) or variable over time (unstable); and (c) controllability, according to whether it is possible to alter the cause (controllable) or there is no possibility of change (uncontrollable). Locus of causality is linked with self-esteem and pride; stability affects expectations and the emotions of helplessness, hopelessness, and hope; while in the third dimension, the cause can elicit regret in the individual if it is controllable, and shame if it is uncontrollable [9].

Weiner's attributional model is commonly used in the study of motivation in the school setting for elucidating the sequential relation among thought, emotion, and action in students [10]. In this regard, each student's attribution has causal dimensions, which are linked with the manifestation of certain emotions and expectations, which in turn influence the future student's behavior in similar academic situations. In the area of mathematics, students who attribute their failures to internal, stable, and uncontrollable causes (e.g., low ability) and their successes to external and uncontrollable causes (e.g., task difficulty) can be more likely to experience anxiety. As a result, they can be less persistent in their future tasks [1113]. Therefore, it is necessary to examine the relation between anxiety and causal attributions in the teaching–learning process in order to intervene properly in the development of students' mathematical competence [1416].

1.1. Relation between Anxiety and Causal Attributions

Despite the influence of anxiety and causal attributions on students' academic results in mathematics, few studies have analyzed the relation between both constructs in child population. The first research was conducted by Willig, Harnisch, Hill, and Maehr [17], using an American child and adolescent sample ($N = 397$). The authors found that high test anxiety was linked with the tendency to attribute successes to external causes, and failures to ability and external causes. The following work was done by Vlahovic-Stetic, Vidovic, and Arambasic [18] with Croatian child population ($N = 147$). Mathematically gifted students reported lower levels of mathematics anxiety, lower attribution of successes to effort and external causes, and lower attribution of failures to ability and external causes compared to non-gifted ones. Several years later, Zhou and Urhahne [19] conducted a study using two child samples from Germany and China. The authors obtained, with 144 German students ($M_{age} = 9.93$, $SD = 0.61$), a negative and significant correlation between test anxiety and attribution of successes to ability. Their results also revealed positive and significant correlations between test anxiety and attribution of successes to external causes, as well as between test anxiety and attribution of failures to both internal and external causes. In the same vein, they obtained, with 272 Chinese students ($M_{age} = 9.87$, $SD = 0.65$), a negative and significant association between test anxiety and attribution of successes to internal causes, as well as a positive and significant association between test anxiety and attribution of successes to external causes. Regarding causal attributions of failures, Chinese participants' scores showed positive and significant correlations between test anxiety and attribution of failures to both internal and external causes. González et al. [20] recently found, with 1078 Spanish children aged 8 to 11 ($M = 9.63$, $SD = 1.12$), that students who scored high on school refusal based on anxiety tended to attribute their failures to internal causes to a greater extent than those who scored low on school refusal based on anxiety. With regard to students with low levels of school refusal based on anxiety, they scored significantly higher on attribution of their successes and failures to external causes. In sum, one in four studies demonstrated an association between greater internal attributions and elevated anxiety [20]; while two studies reported lower internal attributions linked to high anxiety scores [17,19], and one work highlighted an association between anxiety and both internal and external attributions [18].

The previously reviewed studies present contradictory findings concerning the attributional pattern of anxious children, making it complex to compare and generalize the results. This diversity of attributional tendencies obtained can be due to several factors. Firstly, the samples were recruited in different countries and, additionally, Vlahovic-Stetic et al. [18] made a distinction between mathematically gifted and non-gifted students to perform the analyses. Secondly, each work

examined a different form of anxiety (i.e., test anxiety, mathematics anxiety, and school refusal based on anxiety). In this vein, different self-report measures were used to assess these forms of anxiety and causal attributions. Finally, the studies used a variable-centered approach by analyzing differential relations between both constructs. According to Hart et al. [21], the inconsistency of findings in this type of studies could be clarified through the identification of student profiles, as it allows checking if there are different child subpopulations who report differential associations. This person-centered approach has recently been used in the study of the relation between academic causal attributions and child perfectionism [22]. The authors grouped children into profiles of different perfectionist symptoms intensity and analyzed the attributional pattern of each profile. Thus, they have been able to partially explain the absence of consensus in the previous scientific literature. Therefore, it is necessary to study the type of attributions of successes and failures in mathematics according to the possible profiles of anxious children.

1.2. Anxiety Profiles in Childhood

The empirical evidence regarding the configuration of child anxiety profiles is limited. Only one research has been found in Spanish population [23], whose authors administered the Spanish version of the Visual Analogue Scale for Anxiety-Revised (VAA-R) [23] to 911 students between 8 and 12 years old ($M = 9.61$, $SD = 1.23$). The first two factors of this scale assess situations in the school setting. Specifically, the factor Anticipatory Anxiety (AA) assesses anxiety-provoking situations prior to arrival at school, and the factor School-based performance Anxiety (SA) assesses anxiety-provoking situations within the school. However, the third factor refers to Generalized Anxiety (GA) responses. In the four-cluster solution: High Anxiety, High Anxiety School-type (i.e., AA and SA), Low Anxiety, and Moderate Anxiety, the authors identified a profile with anxiety in the school setting. It should be noted that they used the non-hierarchical method *K*-means quick cluster analysis. A large number of studies have resorted to this method in order to identify different student groups who experience similar symptoms in psychoeducational variables (e.g., [24]). However, *K*-means has several limitations that have been covered by latent class analysis (LCA) [25,26]. Two studies of child anxiety have been conducted by using this technique. Firstly, three scales designed to assess various forms of anxiety (i.e., mathematics anxiety, test anxiety, and general anxiety) were administered to two different aged samples from United Kingdom by Carey, Devine, Hill, and Szűcs [27]. They obtained a four-class solution: Low Anxiety, Slight Anxiety, Moderate Anxiety, and High Anxiety, with 817 children between 8 and 9 years old ($M = 109.4$ months, $SD = 3.7$ months). The authors also found a four-class solution in 903 students between 11 and 13 years old ($M = 148.0$ months, $SD = 4.0$ months), although in this case with greater specificity: Low Anxiety, Academic Anxiety (i.e., mathematics anxiety and test anxiety), General Anxiety, and High Anxiety. Mammarella, Donolato, Caviola, and Giofrè [28] subsequently analyzed the same forms of anxiety (i.e., mathematics anxiety, test anxiety, and general anxiety) in a sample of 664 Italian students from 3rd to 6th grade of primary education ($M_{age} = 9.20$, $SD = 1.13$). A three-class solution was obtained: Low Risk, Average Risk, and High Risk of anxiety. None of these classes referred to anxiety in the school setting.

1.3. Research Objectives and Hypotheses

Considering the limitations of the previous empirical findings, this study aims to analyze the relation between anxiety and causal attributions in mathematics in Spanish child population. A person-centered approach will be used for this purpose. In the first place, by means of the LCA technique, there is an attempt to verify the existence of different groups of anxious students. In line with the four anxious profiles of Spanish children identified by Fernández-Sogorb et al. [23] by using *K*-means, it is expected to find a four-class solution, in which school-type could be one of them (hypothesis 1). Secondly, it will also be determined whether there are statistically significant differences between the possible classes of anxiety and the different causal attributions in the area of mathematics. According to previous studies [1113], the class with the highest anxiety levels is expected to show the most maladaptive results, which would consist of attributing the failures to

internal, stable, and uncontrollable causes such as low ability, and the successes to external and uncontrollable causes such as task difficulty (hypothesis 2).

2. Methods

2.1. Participants

The participants were selected by means of random cluster sampling. One or two educational centers from each geographical area (north, south, east, west, and central) of the provinces of Murcia and Alicante were chosen, with a total of 19 public and private schools participating in this study. Four groups, corresponding to the four grades from 3rd to 6th of primary education in Spain, were randomly selected from each school. As a result of this process, 1408 students were recruited, of which 41 (2.91%) were excluded for not obtaining the informed consent from their parents or legal guardians, 52 (3.69%) for not properly completing the scales administered, and 28 (1.99%) because their reading comprehension level was lower than that required to answer the scales.

The final sample consisted of 1287 participants aged 8 to 11 ($M = 9.68$, $SD = 1.20$). The distribution by sex and age is presented in Table 1. Regarding ethnicity, 87.49% of the students were Spaniards, 6.33% South Americans, 4.39% Arabs, 1.58% Europeans non-Spaniards, and 0.21% Asians. The economic and sociocultural context was assessed according to the family's level of studies: 9.74% of the fathers and 10.35% of the mothers were school graduates, 69.28% of the fathers and 65.97% of the mothers had completed secondary studies, and 17.36% of the fathers and 15.08% of the mothers were university graduates. The level of academic qualification of the remaining percentage of fathers and mothers is unknown.

Table 1. Sample distribution by sex and age.

Sex	Age				Total
	8	9	10	11	
Boys (%)	159 (12.4%)	171 (13.3%)	171 (13.3%)	150 (11.6%)	651 (50.6%)
Girls (%)	204 (15.9%)	183 (14.2%)	132 (10.3%)	117 (9.1%)	636 (49.4%)
Total	363 (28.3%)	354 (27.5%)	303 (23.5%)	267 (20.7%)	1287 (100%)

2.2. Measures

2.2.1. Anxiety

Anxiety was measured with the Visual Analogue Scale for Anxiety-Revised (VAA-R). The scale was developed by Bernstein and Garfinkel [29] for childhood and adolescence, and validated in Spanish child population by Fernández-Sogorb et al. [23]. The Spanish version of the VAA-R was used in this study. Its three factors have been described in the introduction: AA consisted of five items (e.g., "On my way to school."), SA consisted of three items (e.g., "Standing up and speaking in front of class."), and GA consisted of three items (e.g., "How I feel right now."). The participants responded to each item on a visual scale of 10 points (steady vs. nervous). In this study, the Cronbach's α coefficients were 0.88 (total of the scale), 0.86 (AA), 0.75 (SA), and 0.71 (GA).

2.2.2. Causal Attributions in Mathematics

Causal attributions in mathematics were measured using the Sydney Attribution Scale (SAS) [30]. The scale is composed by 24 situations that assess the attribution of successes and failures in the area of mathematics (12 situations) and in the area of language (12 situations), two hypothetical results: Success or failure, and three possible causes: Ability, effort, or external causes. Thus, the SAS include a total of 72 items. The internal reliability and construct validity of the scale have been supported by Spanish primary, secondary, and university samples (see Inglés et al. [31] for a review). In the present study, the 12 situations belonging to the area of mathematics of the Spanish version of González-Pumariega, Núñez, and González-Pienda [32] were administered (e.g., imagine

that in math, the teacher teaches you a new way of doing something and you misunderstand it. This is probably because: (1) You should pay more attention; (2) the teacher explains things incorrectly; and (3) all math is hard for you). The participants responded by using a 5-point Likert scale (1 = *False*; 5 = *True*). In this study, the Cronbach's α coefficients for mathematics were 0.88 (success/ability), 0.82 (success/effort), 0.70 (success/external causes), 0.86 (failure/ability), 0.74 (failure/effort), and 0.70 (failure/external causes).

2.3. Procedure

A meeting was held with the management team of each educational center, in which the objectives of the study were presented and their collaboration was requested. Informed consent was then obtained in writing from the participants' parents or legal guardians. The administration of both scales was collectively and anonymously performed in the ordinary classroom in a 45-minute session (five minutes instructions, 10 minutes the VAA-R, and 30 minutes the SAS). In each session, one of the researchers was present in order to inform the students that their participation was voluntary, supervise the completion of the questionnaires, and solve possible doubts. This study was approved by the Ethics Committee of the University of Alicante (UA-2017-09-05). Furthermore, the ethical standards of the Declaration of Helsinki were followed throughout the procedure.

2.4. Statistical Analyses

The anxious profiles were configured by means of the LCA, using the standardized z scores [33] that were obtained in each factor of the VAA-R. This technique creates groups of participants, called latent classes, according to their response pattern. It starts with a class (i.e., profile), in which the classification of all members of the sample is fitted. Then, the participants are reassigned to a progressive number of classes. The optimal number of classes was determined by the following fit indices: Bayesian Information Criteria (BIC), whose value must be the lowest, and entropy, whose value must be close to 1.00 [25]. Likewise, classes in each model were analyzed to verify that no inconsistent classes had been created as a result of too complex models [34].

The differences among the child anxiety classes in the mean scores of all the attributional variables in mathematics were examined by analyses of variance (ANOVA). Post hoc tests (Bonferroni method) were also performed to identify among which groups there were statistically significant differences. The magnitude of these differences was found by calculating the effect size. The d index was used, and the following interpretation criteria were considered: 0.20–0.49 is a small effect, 0.50–0.79 is a moderate effect, and ≥ 0.80 is a large effect [35]. MS Excel application XLstat and SPSS/PC 24.0 were used for statistical analyses.

3. Results

3.1. Latent Class Analysis of Anxiety in the VAA-R

Five models with a different number of classes (two through six) were tested. The fit indices for each model are reported in Table 2. The four-class model showed the lowest BIC value and higher entropy value than the solutions with less and more number of latent classes. Furthermore, the four-class model was also considered the most parsimonious due to the representativeness of the sample through its classes and its interpretability. Therefore, it was accepted for subsequent analyses.

Table 2. Fit indices for the five tested models.

Model	BIC	Entropy
2 classes	10,538.69	0.70
3 classes	10,711.47	0.66
4 classes	10,336.02	0.75
5 classes	10,355.11	0.74

6 classes	10,349.86	0.72
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Note: Boldface values indicate best-fitting model.

Results from the four-class model are shown in Figure 1. The first group (627 participants; 48.72%) obtained moderately low scores in AA and SA, and moderately high scores in AG, so it was named Moderate Anxiety. The second group (363 participants, 28.21%), which was called High Anxiety, scored high in the three factors. The third group (207 participants, 16.08%), which was named Low Anxiety, was characterized by obtaining low scores in the three factors. The fourth group (90 participants, 6.99%) presented low scores in the factors AA and SA, which both assess anxiety in the school setting, and moderately high scores in AG. Therefore, this group was called Low Anxiety School-type.

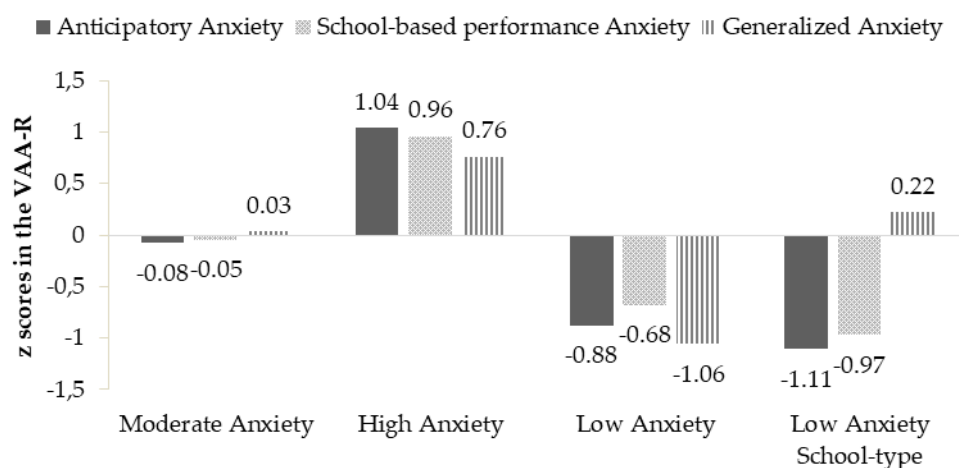


Figure 1. Graphic representation of the four-class model.

3.2. Inter-class Differences in Causal Attributions in Mathematics

Statistically significant differences were identified among the four classes of child anxiety in all the attributional variables in mathematics, except in attributions of success to external causes (see Table 3). The Low Anxiety School-type group presented the highest means in the attributions of success to ability and effort, and in the attributions of failure to external causes, as well as the lowest means in the attributions of failure to ability and effort. The High Anxiety group scored the highest means in the attributions of failure to ability and effort, and the lowest means in the attributions of failure to external causes and in the attributions of success to effort. In addition, the Moderate Anxiety group obtained the lowest means in the attributions of success to ability and effort.

Table 3. Means, standard deviations, and post hoc contrasts between the scores obtained by the anxious profiles in the attributional variables in mathematics.

Variable	Moderate Anxiety		High Anxiety		Low Anxiety		Low Anxiety School-type		Statistical significance and effect sizes		
	M	SD	M	SD	M	SD	M	SD	$F_{(3,1283)}$	p	η^2
MAS	2.71	1.21	2.78	1.29	2.76	1.25	3.30	1.01	6.07	< 0.001	0.01
MES	3.20	0.96	3.20	1.10	3.35	1.07	3.72	0.68	7.96	< 0.001	0.02
MExS	3.74	1.01	3.78	1.02	3.82	1.02	3.96	1.08	1.37	0.25	-
MAF	1.42	1.17	1.69	1.10	1.12	1.03	0.67	0.74	26.14	< 0.001	0.06
MEF	1.77	1.04	2.17	0.99	1.56	0.92	1.17	1.09	31.78	< 0.001	0.07
MExF	4.24	0.95	3.96	0.87	4.51	0.91	4.75	1.13	25.31	< 0.001	0.06

Note: MAS = Mathematics Ability Success, MES = Mathematics Effort Success, MExS = Mathematics External Success, MAF = Mathematics Ability Failure, MEF = Mathematics Effort Failure, and MExF = Mathematics External Failure.

As can be seen from Table 4, the post hoc tests revealed statistically significant differences between the Low Anxiety School-type group and the Moderate Anxiety, High Anxiety, and Low Anxiety groups in the attributions of success to ability and effort, with moderate and small effect sizes. In the attributions of failure, statistically significant differences were found for the three possible causes (i.e., ability, effort, and external causes) between the following groups: Moderate Anxiety and High Anxiety, with small effect sizes; Moderate Anxiety and Low Anxiety School-type, with moderate effect sizes; High Anxiety and Low Anxiety, with moderate effect sizes; and High Anxiety and Low Anxiety School-type, with large effect sizes. Likewise, the Moderate Anxiety and Low Anxiety groups significantly differed in the attributions of failure to ability and external causes, with small effect sizes. Finally, statistically significant differences were found between the Low Anxiety and Low Anxiety School-type groups in the attributions of failure to ability and effort, with small effect sizes.

Table 4. Cohen's *d* value for post hoc contrasts between the mean scores obtained by the anxiety classes in the attributional variables in mathematics.

Variable	Moderate Anxiety vs High Anxiety	Moderate Anxiety vs Low Anxiety	Moderate Anxiety vs Low Anxiety School-type	High Anxiety vs Low Anxiety	High Anxiety vs Low Anxiety School-type	Low Anxiety vs Low Anxiety School-type
MAS	-	-	0.50	-	0.42	0.46
MES	-	-	0.56	-	0.50	0.38
MAF	0.24	0.26	0.67	0.53	0.98	0.47
MEF	0.39	-	0.57	0.63	0.99	0.40
MExF	0.30	0.29	0.52	0.62	0.85	-

Note: MAS = Mathematics Ability Success, MES = Mathematics Effort Success, MAF = Mathematics Ability Failure, MEF = Mathematics Effort Failure, and MExF = Mathematics External Failure.

4. Discussion

The aim of the present study was to examine the relation between anxiety and causal attributions in mathematics in a Spanish child sample, using a person-centered approach. In this sense, the first hypothesis is corroborated by the four-class solution of the LCA, characterized by low, moderate, and high scores in the three factors of the VAA-R, and by low scores in AA and SA. Thus, in line with Fernández-Sogorb et al. [23], one of the four anxious groups identified in primary education students refers specifically to anxiety in the school setting. At the international level, this result is partially consistent with Carey et al. [27] who, although they assessed other forms of anxiety, distinguished an Academic Anxiety group in the four-class solution obtained in British secondary education students. However, the result of the present study is opposed to the four-class solution obtained by Carey et al. [27] with a sample of lower age, and the three-class solution found by Mammarella et al. [28] with Italian students. It is due to the fact that neither Carey et al. [27] nor Mammarella et al. [28] identified any group in primary education with a different pattern in scores of anxiety in the school setting. Therefore, this research follows the trend of the onset of anxiety in the school setting in Spanish primary education students aged 8 to 11. However, it confirms the need for longitudinal studies that report its development throughout childhood and adolescence. In this way, empirical knowledge about the evolution of school-type anxiety profiles would be obtained, and it would be possible to early intervene using systemic programs such as those based on work projects [36].

Furthermore, the statistically significant differences with large effect sizes have been identified in the attributions of failure. Specifically, students with High Anxiety attribute their failures to ability and effort to a greater extent, and attribute their failures to external causes to a lesser extent than those students with Low Anxiety School-type. In the attributions of success, statistically significant differences have been found among the four groups only for ability and effort, with

moderate and small effect sizes. Specifically, the Low Anxiety School-type group scored significantly higher than the Moderate Anxiety, High Anxiety, and Low Anxiety groups. These findings support the second hypothesis in the sense that the group with the highest anxiety levels shows the most maladaptive results; it attributes its failures more to internal, stable, and uncontrollable causes (i.e., ability), and its successes less internally [1113]. However, this group also attributes its failures to internal, unstable, and controllable causes (i.e., effort), and this attributional style is adaptive [37]. This finding is consistent with some previous studies in the attributional pattern for failure situations [20] or in the attributional pattern for success situations [17,19], while it is opposed to other work, whose results showed that anxiety is linked to both internal and external causal attributions [18].

Regarding the Low Anxiety School-type class, it is interesting to note that this specific anxious group shows a particular attributional style: A self-serving bias [38]. Thus, the results evince that students who experience low anxiety levels in scholar situations in particular, attribute their failures more externally and their successes more internally. In line with Hart et al. [21], having addressed, for the first time, the relation between causal attributions in mathematics and child anxiety using a person-centered approach has helped to clarify the previous scientific literature. In this way, the disparity of differential associations obtained in previous studies could be explained by the different anxious groups found in this work, since these groups have shown that their attributional style is different depending on their anxiety profile.

To summarize, approximately 30% of the Spanish child population examined in this study was grouped into the highest category of anxiety produced by the LCA. They tend to be more responsible for their failures than for their successes in the area of mathematics. This pattern affects self-esteem and hopelessness, leading the students to stop trying the next tasks in order to avoid failure [10,39]. On the other hand, approximately 7% of the sample was grouped into the specific Low Anxiety School-type class. This group is more likely to be responsible for their successes than for their results of failure in mathematics. This attributional style has the opposite effect on self-esteem in the sense that enhances it [40]. However, attention must be paid to attribution of failures to external causes. Although this pattern predicts high achievement [41], students could be attributing their bad results to not realistic external factors.

The general results of this research suggest that the most adaptive pattern to develop in child anxiety profiles should be characterized by attributions of successes and failures to internal, unstable, and controllable causes such as effort. It is because this pattern generates realistic expectations and feelings of hope, and thus, students perceive their own control over future results [42]. For achieving this fact, it is advisable to apply cognitive-behavioral intervention programs for anxiety such as FRIENDS for Life [43]. This program is addressed to children and adolescents, and aims to develop helpful skills to manage both general anxiety and anxiety in the school setting [44,45]. It has been recognized by the World Health Organization [46] as an effective anxiety program, and previous studies have recommended it to significantly reduce anxiety levels in comparison with control groups, with small to moderate effect sizes (see Higgins & O'Sullivan [47] for a review). Furthermore, attribution retraining programs based on direct feedback techniques have been proved to have a largely positive impact on children academic achievement (see Chodkiewicz & Boyle [48] for a review) and on adolescents' attributional styles and their performance in the area of mathematics [49]. This type of training program is implemented by professionals of education, who respond to results of children in academic tasks with verbal or written commentaries by orienting their causal explanations towards the desired positive attributional pattern. In this sense, FRIENDS for Life program could be used with an attribution retraining component. Thus, educators could replace the attributional style of each anxious profile with adaptive attributions focused on effort and, at the same time, to improve their general anxiety and anxiety in the school setting levels.

Despite the practical implications of this study, there are several limitations that must be pointed out. In the first place, anxiety has been measured with the VAA-R, so only the anxious self-perception of the participants has been considered. In this sense, the perception of other agents

(e.g., parents, teachers, or classmates) should be taken into account in subsequent work in order to complete the data obtained using the self-report measure. Secondly, the community sample used has not allowed us to know if the four-class solution would be found in specific Spanish child samples, such as those composed by children clinically diagnosed as having anxiety or a specific learning disorder with impairment in mathematics [50]. The possible generalizability across cultures of the groups identified has also not been assessed [51]. Finally, the different attributional styles in mathematics showed by the child anxiety groups have been identified, but it would be convenient to analyze the possible causal relationship between both constructs, as well as the relation with academic performance in mathematics.

5. Conclusions

The present research adds on to the empirical knowledge the relation between anxiety and causal attributions in mathematics in child population. In this sense, this study has provided the first evidence about the fact that the attributional pattern showed by anxious students in the area of mathematics changes according to their anxious profile. In particular, the highest anxiety profile shows maladaptive causal explanations for failures, with reference to ability, and for successes. However, this profile shows an adaptive causal explanation in the sense that it attributes poor results in mathematics also to effort. On the other hand, children with low scores on anxiety in the school setting tend to attribute their failures to external causes. These findings suggest the use of cognitive-behavioral programs for anxiety with an attribution retraining component aimed at fostering the adaptive attributional style (i.e., the preference to use internal, unstable, and controllable causal explanations) for both successes and failures in each anxious profile.

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